



Macronutrient Intake and Metabolic Syndrome Status towards Tour Guide



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Abstract

Background: Bali, unlike a tourism area, was inseparable from the cultural influences of tourists who come to Bali. It was the influence of western food culture that was high in energy and fat and poor fiber. The change in dietary habit was to the western pattern because increasing disease in the community, especially for tour guides beginning with metabolic syndrome with characteristics of obesity, hypertension, dyslipidemia, and hyperglycemia. Objective: The study aims at determining the relationship of macronutrient intake and metabolic syndrome status towards tour guide. The study was conducted in Badung, Bali Province with the goal of the research was the work included travel guide and travel agency foreign tourists. The samples were carried out by multistage random sampling, with a sample size was 109 people. Data were collected from a sample identity, waist circumference, blood glucose and cholesterol levels, blood pressure. The food consumption includes the number, type, and frequency of consumption of foodstuffs with semi-quantitative method frequency food questionnaire (SQ-FFQ). Data were tabulated, processed, and analyzed in accordance with the type and purpose of the study. Results: It's showed the number of subjects as many as 109 people with 73.4% male and 26.6% female. Data components of metabolic syndrome were higher than normal i.e. waist circumference 41 (37.6%), blood glucose level 16.5%, total cholesterol 37.0% and blood pressure 21.1%. A total of 30 samples (27.5%) had metabolic syndrome. The food consumption patterns were seen on the amount that exceeds the adequacy that energy and fat 48.6%, protein 57.8%. The type of foods frequently consumed were rice, chicken, eggs, shrimp, and the squid was a food consumed regularly one to two times a week. The analysis showed a significant correlation between the macronutrients intake with metabolic syndrome status ($p < 0.05$) and exceeds consumption adequacy, have a higher risk of the metabolic syndrome than enough intake (ratio of prevalence = 3-4; confident interval > 1).

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1. Introduction

Nowadays, it has occurred a shift in the pattern of disease in the society from infectious diseases to noncommunicable diseases. The disease begins with physical and clinical changes in a person that is overweight or obesity, hypertension, dyslipidemia, and increased levels of blood glucose called metabolic syndrome (Misra & Shrivastava: 2013). The prevalence of this metabolic syndrome has increased in both developed and developing countries for decades, becoming a public health problem accompanied by increased hospitalization and declining quality of life (Di Daniele, et al.: 2017). Increasing of metabolic syndrome occurs along with increasing age by about 10% in the 20 years old population and reaching 40% at 60 years old. The research results in several countries in the world show the prevalence of metabolic syndrome in adult population about 20-25% (Jafar & Apt: 2012). The prevalence of metabolic syndrome in Mexican Americans is 26.6% (Denova, et al.: 2010). The research was conducted by Soewondo, et al (2010), in Jakarta's population is 28.4% for males and 25.4% for females (Soewondo, et al.: 2010). The research was conducted in Bali shows the prevalence of metabolic syndrome for males 11.28% and for females 20.38% (Dwipayana, et al.: 2011).

The increase in metabolic syndrome prevalence adversely affects one's survival. The research in various places shows that the morbidity and mortality rate of cardiovascular disease due to metabolic syndrome increased significantly (Sugondo: 2007). Indonesia Health Profile Data (2016) indicates that cardiovascular disease is a degenerative disease as one of the causes of death in Indonesia (Kesehatan & Kesehatan: 2017). The suggestion that metabolic syndrome and factors the risks need to get serious attention. Therefore, unlike not to lead to the development of the degenerative diseases.

The various factors contribute to the occurrence of metabolic syndrome. The factors that play an important role in metabolic syndrome are changes in the behavior and society lifestyle (Hattori & Munakata: 2017). Metabolic syndrome emerges as the demographic transition and technological developments are followed by changes in dietary habit and modern lifestyle. The change of acculturation due to modernization marked lifestyle changes that lead to a *sedentary* lifestyle and *western* dietary habit that tends to high energy, carbohydrate and high fat and low in fiber (Lutsey, et al.: 2008). The condition is easy to happen in tourist areas in some countries, especially for tourism actors *e.g.*, tour guides who are in direct contact with tourists. Tour guides serve tourist activities during a visit, including banquets and drinks. Tourists who come have a huge share in changing their eating behavior. The number of tourists who come also followed by the entry of western variety foods that tend to be high-calorie content, high in saturated fat which furthermore related to increasing a risk of obesity, degenerative diseases unlike coronary heart disease and stroke (Naja, et al.: 2015). the research in the tourist area of Greece showed an increase in degenerative diseases along with increasing flow of tourists visiting, as well as the research in Hawaii which is a tourist area also shows increased central obesity due to change in western dietary habit as a result of tourism (Rolfes & Whitney: 2014).

Bali is a major tourist area in Indonesia visited by tourists from various countries. Average tourist arrivals in Bali reach 4.9 million in 2016 (Punarbawa, et al.: 2016). The existence of tourists with their

lifestyle and habits, especially the dietary habit certainly contributes to the lifestyle changes and dietary habit of the Balinese people. The impact gives more influence to the tourism actors, especially the tour guides who serve the tourists directly during the trip. Therefore, the researchers are interested to examine the energy and macronutrient intake with the metabolic syndrome status towards tour guide in Badung regency of Bali Province. The research generally aims at determining the relationship between energy consumption and macronutrients with the metabolic syndrome status towards tour guide in Badung regency, Bali Province.

2. Research Method

The research is an *observational* analytical study with the *Cross-Sectional* design (Sastroasmoro & Ismael: 2002). The study observed at energy intake, macronutrient, and guidance metabolic syndrome status in Badung regency. An observation and measurement is performed simultaneously at a certain point of time and analyzed the relationship between risk factors of energy and macronutrient intake with metabolic syndrome status as outcomes. The present research was planned to be conducted in Badung regency which was a tourist area with research time for four months from May to September 2016.

The target population in the study is a tour guide in Badung regency. The affordable population is a tour guide working in Badung District Travel, Bureau Office during the 2006-2016 period. Whereas, the sample is part of the population that meets the inclusion criteria *i.e.*, Male or female aged between 25-50 years old, established as a permanent employee at the Travel Bureau of Badung regency, willing to be studied in signing inform concern. Whereas, the exclusion criteria are tour guides who suffer from a chronic disease. Therefore, they have to do special dietary habit and routine maintenance.

The determination of the number of the sample was determined based on the calculation of the sample number in a cross-sectional study in one population (Soewondo, et al.: 2010). Taking into calculating the proportion (P) 0.5, Q= (1-p), confidence (α = 95%), 90% error 10%. Then, it is obtained a large sample at least 99 people. To anticipate the possibility of drop-out added reserves of 10% (10 people). Therefore, the total sample is 109 people. The samples selection that met the inclusion and exclusion criteria was determined by *multi-stage random sampling*. In the early stages, South Badung was chosen as the location of most offices of travel agencies serving foreign tourists. It is selected one random sub-district from four sub-districts. Then, it is randomly selected three Foreign Travel Bureau offices registered in Tourism Department serving Japanese, Chinese, European (Russian, Dutch, English, and Italian) tourists. The proportional random sampling according is to the minimum sample number required. Based on the method, Tuban sub-district and three travel bureaus in Tuban sub-district are PT. JTB Indonesia, PT. Rama Tour and Travel, and PT. Asia Collection Tour.

The types of data are collected in the study included sample identity data, macronutrient intake (energy intake, protein, fat, and carbohydrate), metabolic syndrome data (waist circumference, blood pressure, blood sugar, and cholesterol levels) and other supporting data.

Sample identity data and supporting data are collected by interview using questionnaire. The consumption data (energy and macronutrient intake are collected using *Semi-Quantitative of Food Frequency Questionnaire* method (SQ-FFQ) with the support of Food Model. Metabolic Syndrome status data is collected by measuring blood pressure using Citizen Methylmethane tension meter with sitting position, blood sugar (fasting glucose), and cholesterol/triglyceride levels with *Multi Check Parameter*, Nesco brand and waist circumference measurements with Medline threshold waistline 0.1 cm. In the measurement of glucose and cholesterol levels performed by capillary blood by enzymatic method and performed in the morning (at 7 am - 8 am).

Data that has been collected then processed (done editing, cleaning) and analyzed in accordance with the purpose. The data of energy intake and macronutrient (energy, carbohydrate, protein, and fat) were processed by using survey 2010. It is looked for daily average intake value and categorized to know the level of adequacy by comparing daily consumption with Numbers of Adequate Nutrition individually (NAN). The data on the measurements of tension, glucose, cholesterol, and waist circumference are assessed for mean values and categorized to determine the status of metabolic syndrome (if three indicators are found to be above normal) with criteria according to National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) (Anuurad, et al.: 2003). Bivariate to determine the

difference in proportion and the relationship between energy intake and macronutrient with metabolic syndrome and calculate the prevalence ratio to determine the amount of intake risk of the incidence of metabolic syndrome in the study subjects at 95% confidence level.

3. Results and Analysis

a) Sample Characteristics

The research sample is a tour guide who works on Foreign Travel Bureau in Badung Regency. The number of samples involved in the study is 109 people who came from three travel agents selected by proportional random sampling. Based on the research conducted, the characteristics of the sample shows most of the male sex sample is 73.4%. Whereas, the proportion of female samples is 26.6%. The average age of the sample is 42.2 years (± 6.2 years) with the lowest age being 42.4 years and the highest 55 years. Most age groups were in the age group 40-50 years (56.9%) and only 7 people (6.4%) were in the <30 years age group, as shown in Table 1.

Table 1
Distribution of Sample Characteristics

No.	Characteristics	Total (n)	Percent (%)
1	Gender		
	Male	80	73,4
	Female	29	26,6
	Total	109	100,0
2	Age group		
	< 30 years old	7	6,4
	30-40 years old	31	28,4
	40-50 years old	62	56,9
	> 50 years old	9	8,3
	Total	109	100,0
3	Education		
	Senior High School	27	24,8
	Diploma	37	33,9
	Bachelor Degree	45	41,3
	Total	109	100,0

In terms of education, Table 1 shows the highest proportion of education is in the sample with the education of bachelor degree (42.0%), diploma 34.2%, and 24.8% have high school education.

b) Component of Metabolic Syndrome

1) Waist circumference

Measurement of waist circumference or abdominal circumference is conducted by using elastic waistline *Medline*. Based on WHO criteria for Asia Pacific region ([Esmailzadeh, et al.: 2007](#)). The central obesity criteria, if waist circumference > 90 cm for males and > 80 cm for females. The average waist circumference sample is 85,1 cm (± 10.2 cm). Based on the measurement results obtained 41 people (37.6%) have central obesity as shown in Figure 1.

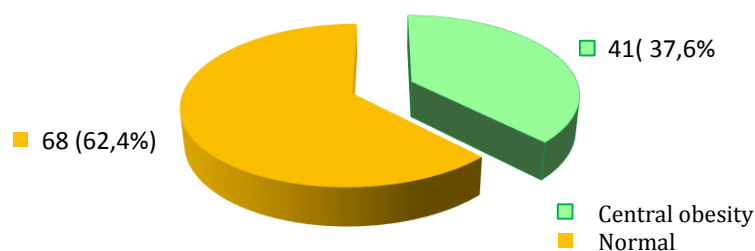


Figure 1. The proportion of sample according to waist circumference

2) Blood Glucose Level

Blood sugar levels measured are fasting blood glucose, *i.e.*, fasting glucose levels do not consume food or drinks containing energy for eight hours. Fasting blood glucose levels considered normal for screening purposes are <126 mg/dl. Based on the results of the data collection is obtained 18 people (16.5%) have high fasting glucose (> 126 mg/dl), as shown in Figure 2.

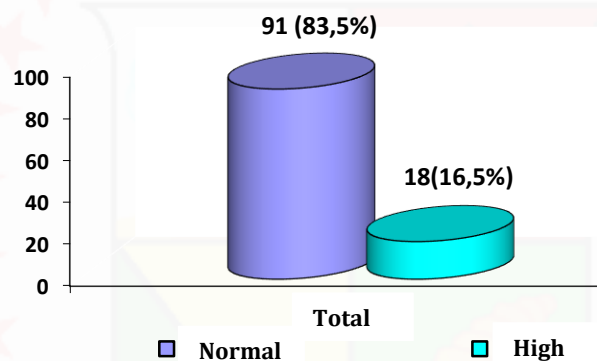


Figure 2. The proportion of sample according to fasting blood glucose level

3) Cholesterol levels

Cholesterol is one part of the lipid that is needed by the body. Cholesterol level is considered normal is <200 mg/dl. Based on the data collected, the average cholesterol level of the sample is 187,7 mg/dl ($\pm 47,2$ mg/dl). A total of 40 samples (37.0%) have a high cholesterol level.

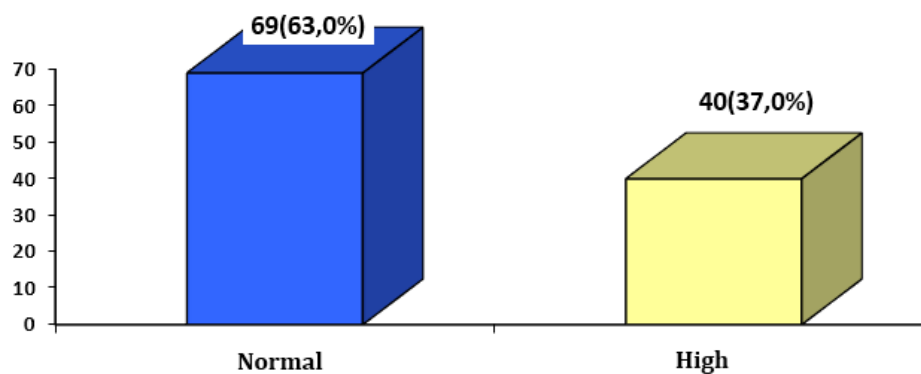


Figure 3. The proportion of sample towards cholesterol level

4) Blood Pressure Levels

Blood Pressure Levels of the sample is measured by sitting position. The results showed 23 samples (21.1%) have a risk of hypertension with blood pressure $> 130/85$ mmHg. The samples that also have a low blood pressure with tension $<120/80$ mmHg of 18 people (16.5%).

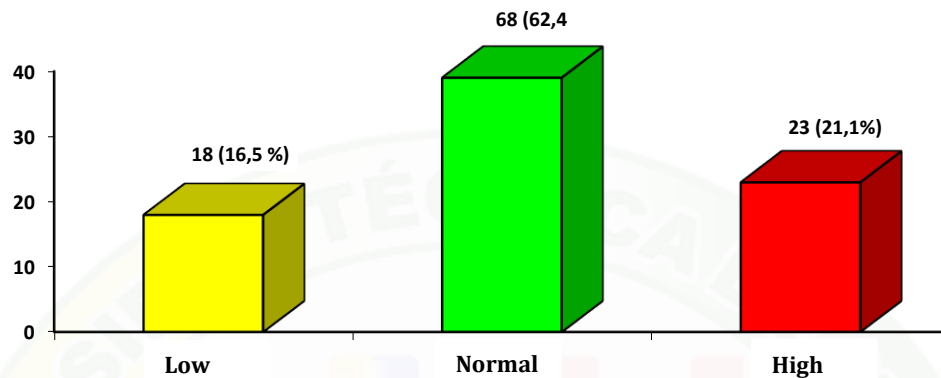


Figure 4. The proportion of samples according to blood pressure

5) Status of Metabolic Syndrome

Metabolic syndrome is assessed from indicators of waist circumference, blood pressure, glucose levels, and blood cholesterol. According to the *National Cholesterol Education Program Adult Treatment Panel (NCEP-ATP II)*, three people have metabolic syndrome, if the three measurement results of the four indicators show more than normal value. Based on these criteria, it is found that 30 samples (27,5%) have metabolic syndrome, even there is metabolic syndrome sample with four indicators with a value exceeding normal that is 8 people (7.3%).

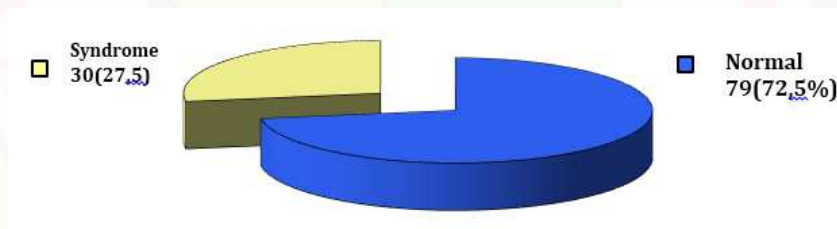


Figure 5. Status of sample metabolic syndrome

c) Energy intake and Macronutrient

The nutrient intake of the sample is part of the dietary habit in terms of its amount. The average energy intake of the sample is 2532 cal/day (± 396.3 cal/day) with the lowest consumption is 1545 cal/day and the highest 3150 cal/day. If it is compared with an individual Recommended Dietary Allowance (RDA), 53 samples (48.6%) have a high energy consumption above the sufficiency rate.

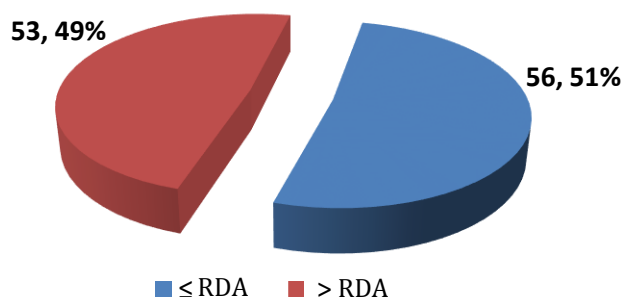


Figure 6. The proportion of Sample Energy Intake

It is viewed from the intake included carbohydrate, protein, and fat macronutrient showed average carbohydrate of the sample is 289, 4 g/day (\pm 57.6 g), the most sample is 59 people (54.1%) have a carbohydrate intake above the sufficiency nutrition is 45.9% carbohydrate intake under adequacy. The mean protein intake of the sample is 64.95 g/day (\pm 8.5 g) and 63 (57.8%) have a protein intake exceeding the sufficiency rate.

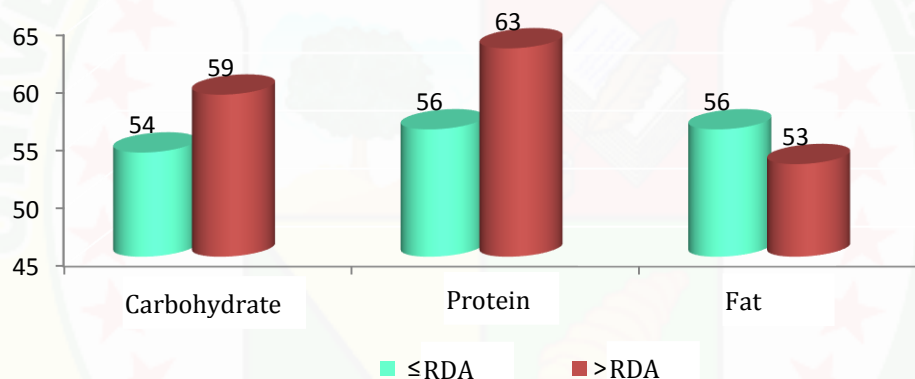


Figure 7. Proportion of sample macronutrient contents

Figure 7 shows the average fat intake of the sample is 69.5 g/day (\pm 7.7 g). If it is compared with the adequacy, samples consuming fat above the adequacy is 53 people (48.6%).

d) Status of Metabolic Syndrome Based on Macronutrient Intake

The differences in the proportion of metabolic syndrome status are seen based on energy intake, carbohydrates, fats, and proteins level. The crossing of the table data indicate the energy intake level, out of 30 samples with metabolic syndrome is 21 people have energy intake over RDA. It is 9 people with adequate intake also have metabolic syndrome. The result of the statistical analysis showed that there is a significant difference of energy intake level based on a sample of the metabolic syndrome status ($p = 0,005$). In protein intake, there is a difference in the proportion of metabolic syndrome status based on protein intake level ($p = 0.011$). A total of 23 people (76.7%) samples with metabolic syndrome status have a protein intake exceeding the adequacy rate. The status of metabolic syndrome based on the level of energy and macronutrient intake can be seen in Table 2.

Tabel 2
Status of metabolic syndrome based on energy and macronutrients intake

Variable	Metabolic Syndrome Status						Q ²	P value
	Syndrome		Non		Total			
	N	%	N	%	n	%		
Energy Intake level								
> adequacy	21	70,0	32	59,5	53	48,6	7,57	0,005
≤ adequacy	9	30,0	47	40,5	56	51,4		
Total	30	100,0	79	100,0	109	100,0		
Carbohydrates intake level								
> adequacy	20	66,7	39	56,3	59	54,1	4,82	0,021
≤ adequacy	14	33,3	40	43,8	54	45,9		
Total	30	100,0	79	100,0	109	100,0		
Protein intake level								
> adequacy	23	76,7	40	50,4	63	57,8	6,04	0,011
≤ adequacy	7	23,3	39	49,6	46	42,2		
Total	30	100,0	79	100,0	109	100,0		
Fat intake level								
> adequacy	22	73,3	31	39,2	53	48,6	10,11	0,001
≤ adequacy	8	26,7	48	60,8	56	51,4		
Total	30	100,0	79	100,0	109	100,0		

Regarding fat intake is 73.3% cases with metabolic syndrome have an intake above adequacy and 23.3% have an adequate intake ($p = 0.02$).

e) The Risk of Macronutrient Intake towards Metabolic Syndrome Status

The difference in risk of dietary habit on the status of sample metabolic syndrome is assessed based on the prevalence ratio (RP). The results showed that in carbohydrate intake, samples with carbohydrate intake above adequacy have a risk of having metabolic syndrome 3.4 times greater than the sample with less or equal to adequacy ($RP = 3.4$, $IK\ 1.3-8.3$, $p\text{-value}\ 0,017$). The risk amount of energy intake and macronutrients to the metabolic syndrome can be seen in Table 3.

Table 3
The risk of intake of micronutrients towards metabolic syndrome status

Variable	Metabolic Syndrome Status				Total		RP	IK	P value
	Syndrome		Non						
	N	%	N	%	n	%			
Energy intake level									
> Adequacy	21	70,0	32	59,5	53	48,6	3,4	1,3-8,3	0,007
≤ Adequacy	9	30,0	47	40,5	56	51,4			
Total	30	100,0	79	100,0	109	100,0			
Carbohydrate intake level									
> Adequacy	20	66,7	39	56,3	59	54,1	2,5	1,4-5,1	0,036
≤ Adequacy	14	33,3	40	43,8	54	45,9			
Total	30	100,0	79	100,0	109	100,0			
Protein intake level									
> Adequacy	23	76,7	40	50,4	63	57,8	3,2	1,2-8,3	0,017
≤ Adequacy	7	23,3	39	49,6	46	42,2			
Total	30	100,0	79	100,0	109	100,0			
Fat intake level									
> Adequacy	22	73,3	31	39,2	53	48,6	4,2	1,6-10,7	0,002
≤ Adequacy	8	26,7	48	60,8	56	51,4			
Total	30	100,0	79	100,0	109	100,0			

Total	30	100,0	79	100,0	109	100,0
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In protein intake, samples with protein intake > adequacy have an odds of the metabolic syndrome 3.2 times greater than inadequacy levels of consumption (RP 3.2, IK, 1.2-8.3) and fat intake have a risk 4,3 times is greater compared with enough intake (IK 1,6-10,7).

Discussion

Metabolic syndrome is a set of symptoms that appear at the beginning of degenerative diseases *e.g.*, diabetes mellitus and coronary heart disease (Liu, et al.: 2015). According to WHO or NCEP-ATP II, a person is stated to have a metabolic syndrome, if it is found at least three components of metabolic syndrome unlike fasting blood glucose > 110 mg/dl, waist circumference > 90 cm for male and > 80 cm for female, cholesterol > 200 mg/ dl, tension > 130/85 mg/dl (Al-Daghri, et al.: 2013). Increasing incidence of metabolic syndrome is closely related to consumer behavior that leads to the western dietary habit with high energy intake, carbohydrates, protein and fat [4], [18], [19]. A tour guide is a sufficient group susceptible to metabolic syndrome due to intensive interaction with the tourists. They handle unlike interactions can change the lifestyle and eating behavior of the tour guide.

The study is conducted on 109 tour guides working in Foreign Travel Bureau in Badung regency. The results showed that most of the samples are male (73.4%) with the highest proportion in the age group 40-50 years (56.9%). It had been undergraduate education background (41.3%). It is related to the fact that the job as a tour guide requires physical endurance in work that knows no time in serving tourists. Most of the foreign tourists who come to Bali at around 1 am. Therefore, the more job opportunities are taken by male than female. They are also required to have an adequate education. The tour guides must have good knowledge of all aspects of the social culture visited area. They are able to demonstrate the presence of hospitality and professional attitude in addition to language fluency accordance with the language adopted by tourists (Oktaviyanti: 2013). In terms of age groups, most aged 40-50 years and has been working long enough as a tour guide (> 6 years). The age group is the age group at risk of metabolic syndrome, which began to decrease cell function followed by inappropriate lifestyle. The increased risk of metabolic syndrome increases with age (Matta, et al.: 2016), (Ervin: 2009).

Based on the criteria of at least three components of metabolic syndrome found in the sample, it is obtained 30 people samples (27.5%) who have metabolic syndrome. The results of the present study are in accordance with the review results of several studies in the Asia Pacific, the prevalence of metabolic syndrome ranged from 11.9 to 49% and in particular the prevalence of metabolic syndrome in Indonesia around 28.4% (Ranasinghe, et al.: 2017). Similarly, the research in the Greek tourist area showed an increase in components metabolic syndrome and degenerative diseases along with an increase in the flow of visiting tourists (Reaven: 2006). The research is conducted in Bali by Dwipayana et al. (2011) found that the prevalence of metabolic syndrome is 11.28% for males and 20.38% for females (Yu, et al.: 2015). The results are lower than the results are obtained in the present study. It is related to the change of acculturation and demographic transition of society in the last 10 years which have an effect on the change of society lifestyle toward *sedentary* pattern or less movement and western dietary habit as result of tourist flow coming to Bali. Increasing the prevalence of metabolic syndrome has a devastating effect on one's survival. A research in several places shows increased morbidity and mortality due to DM and coronary heart disease that begins with symptoms of metabolic syndrome (Redinger: 2007). The research is conducted in the United States, 21.7% heart patients with metabolic syndrome have died (Nelms, & Sucher: 2015).

If, it is viewed from each component of metabolic syndrome 37.6% samples are obese, central obesity is an indicator of excessive abdominal fat accumulation related to metabolic syndrome. The fat is lipolytic and is the cause of insulin resistance (Bays HE, et al.: 2013), (Di Daniele, et al.: 2017). A total of 37.0% samples have cholesterol levels > 200 mg/dl. It is called hypercholesterolemia. Cholesterol has an important role for the body, *e.g.*, for the formation of hormones, components of cell membrane, however, excess cholesterol triggers an increase in LDL cholesterol that accumulates in blood vessel walls resulting in complications of atherosclerosis and cardiovascular disease (Anderson, et al.: 2011), (Shu, et al.: 2015). The accumulation of cholesterol causes constriction of even blockage of blood vessels resulting in

increased tension, which was found to be approximately 21.1% in the sample. Hypercholesterolemia also causes insulin hormone imbalance that leads to insulin resistance^{12,28}. This is evidenced by the finding of hyperglycemia in the sample of 16.3%. Increased blood glucose levels are one of the manifestations of metabolic syndrome that is the beginning of diabetes mellitus (Aekplakorn, et al.: 2015). Increased levels of glucose can be caused by decreased production of insulin in pancreatic beta cells due to carbohydrate intake over continuous adequacy. It leads to central obesity that inhibits insulin work with the effects of *sedentary* hyperglycemia.

The one factor is suspected to be a risk of metabolic syndrome is a dietary habit, especially the amount of energy and macronutrient intake unlike carbohydrate and excessive fat. The results showed that the proportion of samples with sample habits with energy intake, carbohydrates, proteins, and fats that exceeds sufficiently high adequacy, nearly 50% for energy and fats, even carbohydrates, and proteins that exceeds > 50%. It illustrates that energy sources *e.g.*, carbohydrates, fats, and high-fat proteins that characterize of the western dietary habit have also become the samples eating habits. The condition is also followed by increased consumption of foodstuffs *e.g.*, carbohydrates sources, animal protein sources that consists a lot of saturated fat and cholesterol included rice, fatty meats, shrimp, squid, eggs, *lawar* that consists of a lot of saturated fat. Saturated fats of oil and hydrogenated oils *e.g.*, butter and margarine can increase blood cholesterol, LDL cholesterol and the risk of cardiovascular disease (World Health Organization: 2014).

Dietary habit changes in the tour guide related to the tourists handled. The presence of tourists coming to Bali due to the social contacts and intensive interaction to their tour guides. According to Oktaviyanti (2013), stated that interaction causes an attempt to imitate the lifestyle of tourists as a demonstrative effect that leads to changes in culture, one of the changes of eating culture from the traditional dietary habit to the western culture. The results of the present study are in accordance with research in Hawaiian tourist areas wherein the tour guides and surrounding communities have a western dietary habit. It is followed by an increase in central obesity events as a result of tourists coming to the area. The tour guides in charge of serving tourists always come along with tourists in every activity. It is conducted including a meal. Therefore, their dietary habit indirectly follows the tourist's pattern. This is evidenced by the sample dietary habit that serves Japanese tourists, Korean who tend to like to consume, seafood such as shrimp, squid, and crab, also dribbled to consume these foods. Likewise, the samples serving European tourist, they often join a banquet directly with the western dietary habit of protein sources included chicken, turkey, and beef that are much-horned energy, fat, and poor fiber.

A dietary habit itself implies an increase in blood lipid levels, especially cholesterol and saturated fatty acids, deposits of fat reserves in the form of triglycerides that cause of the central obesity. Increased levels of triglycerides and cholesterol stimulate the work of lipase enzymes to degrade a fat that inhibits insulin action resulting in insulin solvency. The further impact is the symptoms of persistent metabolic syndrome followed by hypertension, diabetes mellitus, and cardiovascular disease.

The results of relationship analysis and dietary habit risk factors on metabolic syndrome status showed a significant difference of proportion between the level of energy consumption, protein, fat, and food diversity consumed with the status of metabolic syndrome ($p < 0.05$). The samples on the higher levels of energy, protein, and fat intake exceeded the adequacy of having a greater proportion of the metabolic syndrome as well as mastering a risk of having greater metabolic syndrome than adequate consumption according to the need for prevalent ratios ranging from 3-4 ($p < 0.05$; $IK > 1$).

The several research results are in accordance with the results of the present study. The results showed that nearly 80% adult population in Michigan consuming *fast food* with high energy and fat content had a higher risk of obesity and metabolic syndrome. Yu, et al (2015) and Shu, et al (2015) studies showed that the pattern consumption of foods derived from animals that consist of a lot of saturated fat and cholesterol. It has an effect on increasing of central obesity as a component of metabolic syndrome and coronary heart disease. The research is conducted in tourist areas by Denova, et al (2010) in Mexico, Adaghri, et al (2013) in Saudi Arabia. The research in Thailand showed the relationship between dietary habit with metabolic syndrome, the population with western dietary habit composition and unbalanced have a tendency to experience metabolic syndrome.

The dietary habit consumption on a high percentage of the energy and fat as well as the types of foods that consists of a lot of carbohydrates, fats, and cholesterol is one of the characteristics of a modern

lifestyle that leads to increased status of metabolic syndrome. The dietary habit can not be avoided, occurred in tourist areas that have undergone a demographic transition due to the influence of tourists. Therefore, the tour operators such as tour guides will experience changes in lifestyle including dietary habit. The high-energy and high-fat dietary habit mechanisms against the development of metabolic syndrome are not known for certain, but the proportion of high-fat and energy sourced from high-fat animal protein foods raises the levels of saturated fatty acids in serum lowers plasma insulin levels and decreases insulin sensitivity.

4. Conclusion

- a) Based on the three indicators of metabolic syndrome *i.e.*, waist circumference, blood glucose, cholesterol, and blood pressure, found 27,5% of tour guides have metabolic syndrome.
- b) Energy and macronutrients intake towards the tour guide shows the amount of intake that exceeds the adequacy of energy and fat is 48.6%, 67.3% protein, and carbohydrates 54.1%
- c) There is a significant difference in the proportion of metabolic syndrome status based on energy and macronutrient intake towards the tour guides ($p < 0.05$) and the prevalence ratio of the risk factors for energy and macronutrient intake showed that energy intake and macronutrients are risk factors for the incidence of metabolic syndrome ($IK > 1$, $p < 0.05$)

Suggestion

The further research is needed that explores various other risk factors for metabolic syndrome status towards the tour guides and intervention studies related to improved dietary habit behavior for them.

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